

Europäisches Patentamt  
European Patent Office  
Office européen des brevets



(11) **EP 1 028 421 A3**

(12) **EUROPEAN PATENT APPLICATION**

(88) Date of publication A3:  
29.11.2000 Bulletin 2000/48

(51) Int Cl.7: **G11B 7/24**

(43) Date of publication A2:  
16.08.2000 Bulletin 2000/33

(21) Application number: **00102765.5**

(22) Date of filing: **10.02.2000**

(84) Designated Contracting States:  
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU  
MC NL PT SE**  
Designated Extension States:  
**AL LT LV MK RO SI**

(72) Inventors:  
• Yasuda, Koichi  
Shinagawa-ku, Tokyo (JP)  
• Kurokawa, Kotaro  
Shinagawa-ku, Tokyo (JP)

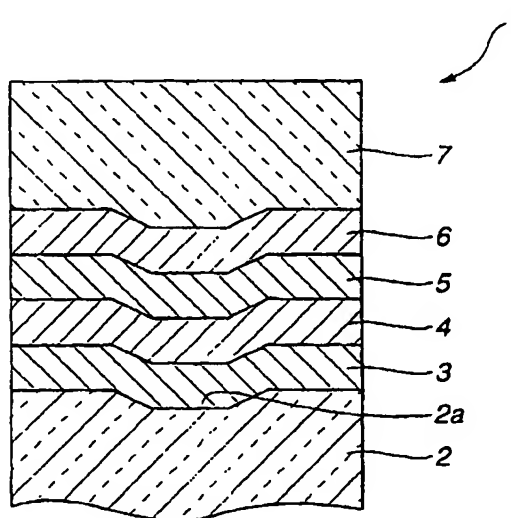
(30) Priority: **12.02.1999 JP 3508699**

(74) Representative:  
**MÜLLER & HOFFMANN Patentanwälte  
Innere Wiener Strasse 17  
81667 München (DE)**

(71) Applicant: **SONY CORPORATION  
Tokyo (JP)**

(54) **Multi-layered optical disc**

(57) A multi-layered optical disc having its recording unit comprised of plural information recording layers (4,6), in which two or more information recording layers are layered on a substrate (2) 0.3 to 1.2mm in thickness, with the interposition of a transparent layer (5), to form a recording unit, a light transmitting protective layer is formed on the recording unit to a thickness of 10 to 177µm (7), and in which the light is illuminated from the side of the light transmitting protective layer to effect recording and/or reproduction of information signals. At least one of the information recording layers (6) except the information recording layer formed at a remotest position from the light transmitting protective layer has a phase change material as a recording material. A refractive index  $nc_1$  and an extinction coefficient  $kc_1$  in the crystallized state and a refractive index  $na_1$  and an extinction coefficient  $ka_1$  in the amorphous state of the phase change material constituting the first information recording layer (6) as counted from the light transmitting protective layer satisfy the relationship of  $(nc_1/na_1) \leq 12$ ,  $(kc_1/ka_1) \leq 12$  and  $(kc_1/ka_1) \leq 5 (nc_1/na_1)$ , where the cases of  $kc_1/ka_1 < 1$  and  $nc_1/na_1 < 1$  are excluded.



**FIG.1**



European Patent  
Office

## EUROPEAN SEARCH REPORT

Application Number  
EP 00 10 2765

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
Y	PATENT ABSTRACTS OF JAPAN vol. 1997, no. 11, 28 November 1997 (1997-11-28) & JP 09 198709 A (SONY CORP), 31 July 1997 (1997-07-31) * abstract *	1-12	G11B7/24
Y	WO 97 14145 A (PHILIPS ELECTRONICS N.V.) 17 April 1997 (1997-04-17) * page 11, line 4 - line 18; figure 2 *	1-12	
A	EP 0 762 405 A (SONY CORPORATION) 12 March 1997 (1997-03-12) * column 6, line 13 - line 21; figure 8 * * column 7, line 25 *	1,10,11	
A	EP 0 810 590 A (INTERNATIONAL BUSINESS MACHINES CORPORATION) 3 December 1997 (1997-12-03) * page 4, line 3 - line 16; figure 2A * * page 6, line 2 - page 7, line 20; figure 5 *	1,10,11	
A	WO 98 28738 A (PHILIPS ELECTRONICS N.V.) 2 July 1998 (1998-07-02) * page 3, line 8 - line 26; figure 1 *	17,18	TECHNICAL FIELDS SEARCHED (Int.Cl.7)
A	US 5 453 346 A (KATSUMI KAWAHARA ET AL) 26 September 1995 (1995-09-26) * column 6, line 15 - line 48; figure 1 *	16,17,19	G11B
A	EP 0 847 049 A (MITSUBISHI CHEMICAL CORPORATION) 10 June 1998 (1998-06-10) * page 9, line 38 - page 10, line 18; figure 3 *	16,19	
The present search report has been drawn up for all claims			
Place of search <b>BERLIN</b>		Date of completion of the search <b>5 October 2000</b>	Examiner <b>Gerard, E</b>
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	



European Patent  
Office

Application Number  
EP 00 10 2765

#### CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing more than ten claims.

- ☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid, namely claim(s):
- ☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

#### LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

- ☒ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.
- ☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.
- ☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:
- ☐ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:



European Patent  
Office

**LACK OF UNITY OF INVENTION  
SHEET B**

Application Number  
EP 00 10 2765

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. Claims: 1-15

Optimisation of the optical properties of the phase change layers of a multi-layered optical disc

2. Claims: 16-31

Multi-layered optical disc with crystallisation promoting film, enhancement film, reflective film and semi-transparent enhancement film

**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 00 10 2765

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
The members are as contained in the European Patent Office EDP file on  
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

05-10-2000

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 09198709 A	31-07-1997	NONE	
WO 9714145 A	17-04-1997	AU 6998396 A EP 0800699 A JP 11500253 T US 5689497 A	30-04-1997 15-10-1997 06-01-1999 18-11-1997
EP 762405 A	12-03-1997	JP 9063120 A CN 1167316 A SG 42432 A US 5907534 A	07-03-1997 10-12-1997 15-08-1997 25-05-1999
EP 810590 A	03-12-1997	CN 1167313 A JP 10116441 A US 5761188 A	10-12-1997 06-05-1998 02-06-1998
WO 9828738 A	02-07-1998	EP 0888616 A JP 2000505930 T US 5965229 A	07-01-1999 16-05-2000 12-10-1999
US 5453346 A	26-09-1995	JP 6282876 A	07-10-1994
EP 847049 A	10-06-1998	JP 10172179 A US 6108295 A US 6115352 A	26-06-1998 22-08-2000 05-09-2000